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Module 6 Lab Activity: Correlation, Partial Correlation & SLR
PSY 652 Research Methods
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This activity uses functions from the base R package and other specified packages to accomplish similar tasks in R.

Dataset Description: A researcher was interested in assessing the relationship between caloric deficit and pounds lost over the course of a 1 month weight loss program designed for men age 40 to 50 in CO. 100 obese men were randomly selected to participate. The researcher measured the following:

Variables:

1. lbslost = pounds lost after one month on the weight loss program
2. caldeff = caloric deficit over the course of the program (expressed in 1000 calories). A caloric deficit is a state in which you are burning more calories than you eat.
3. selfeff = self-efficacy for weight loss at the start of the program
4. id = subject ID number

Activity Instructions:

1. Download the "wtloss_parta.csv" and "wtloss_partb.csv" datasets from the Module 6 Lab dropbox folder and save it your lab project folder.
2. Create a new R notebook from your project file and name it "wtloss_notebook"
3. Create a new R chunk with a first level header: "Load Libraries"
    a. load the ppcor, psych, olsrr, apaTables, and tidyverse packages in this R chunk (you may need to install some of these)
4. Create a new R chunk with a first level header: "Import Data"
    a. read in the "wtloss_parta.csv" and assign it to an object names "wtlossa"
    b. read in the "wtloss_partb.csv" and assign it to an object names "wtlossb"
5. Create a new R chunk with a first level header: "Merge Data"
    a. Merge the wtlossa and wtlossb dataframes together by subject ID number and assign this new dataframe to an object called "wtloss". Confirm that this merge worked by clicking on the wtloss dataframe in your global environment (this should include 100 observations of 4 variables).
6. Write a first level header: "Describe Data"
    a. Create a new R chunk with the second level header: "Via base R's summary function." Calculate descriptives for the wtloss dataframe using the summary function.

   b. Create a new R chunk with the second level header: "Via psych's describe function." Calculate descriptives for the wtloss dataframe using the psych function.

7. Write a first level header: "Check for outliers"
   a. Create a new R chunk with a second level header: "Via Base R's boxplot function." Create a boxplot for the *lbslost* variable in the wtloss dataframe using the boxplot function
   b. Create a R chunk with a second level header: "Via ggplot2's ggplot function." Using ggplot(), create a boxplot for the *lbslost* variable in the wtloss dataframe.
      i. ***Hint:*** *ggplot(dataset, aes(y = var)) + geom_boxplot()*
   c. In the white space below, identify if there are any outliers.
8. Write a first level header: "Plot relationships between variables"
9. Create a new R chunk with a *second level* header: "Via Base R's plot function"
   a. Using plot(), plot all of the possible correlations between: *lbslost*, *caldef*, & *selfeff*
10. Create a new R chunk with a *second level* header: "Via ggplot2's ggplot function"
    a. Using ggplot(), plot all of the possible correlations between: *lbslost*, *caldef*, & *selfeff*. Add the best fit linear line.
    Hint: *ggplot(dataset, aes(x = var1, y = var2)) + geom_point() + geom_smooth(method = "lm")*
11. Write a first level header: "Correlations"
12. Write a second level header: "Pearson's Correlation Matrices"
    a. Create a new R chunk with the third level header: "Via base R's cor function." Create a correlation matrix for all variables in the wtloss dataframe using the cor function.
    b. Create a new R chunk with the third level header: "Via apaTables' apa.cor.table function." Create a correlation matrix for all variables in the wtloss dataframe using the apa.cor.table function.
    Hint: *apa.cor.table(dataframe_name, "file_name.doc", show.conf.interval=TRUE)*
    Note: *The apa.cor.table function creates a .doc form of this correlation matrix, which will be saved in your folder for this R notebook. Open this document in your project folder to make sure it worked. This package can be a big time-saver when preparing tables for publication!*
    c. In the white space below this chunk, describe each correlation. What direction are the correlations? Are they strong or weak correlations? (Note: you don't need to interpret subject id number here)
13. Write a first level header: "Get Partial Correlation"
    a. In a new R-chunk, use the pcor.test function to get the partial correlation between *lbslost* and *caldef*, while controlling for *selfeff*.
    b. In your own words, interpret the estimate and p-value of the output.

14. Write a first level header: “Get Semipartial Correlation”
    a. In a new R-chunk, use the spcor.test function to get the semipartial correlation between *lbslost* and *caldef*, while controlling for *selfeff*.
    b. In your own words, interpret the estimate and p-value of the output.
15. Create a first level header: “Fit a Simple Linear Regression (SLR) Model”
    a. In a new R-chunk, create a linear model in which *caldef* predicts *lbslost.* Save this model to an object called “mod1”
       Hint: model_name <- lm(y ~ x, data = dataframe_name)
    b. Write a second level header: “Display SLR Model Results”
    c. Create a new R chunk with a third level header: “Via base R’s summary function.” Use the summary function to display the model’s results.
    d. Create a new R chunk with a third level header: “Via olsrr’s ols_regress function.” Use the ols_regress function to display the model’s results.
    e. In the white space below, interpret your model output, including:
        i. the beta for the intercept and *caldef*
        ii. the standard error and confidence intervals for the beta estimate
        iii. the *p* value for the beta estimate
        iv. the model R^2
16. Once you’ve completed all of these steps, Restart R and Run All Chunks, and then preview your notebook. Save your notebook as both a .Rmd and an html file and exit RStudio.
17. Upload both the .Rmd and html version of your notebook to the assignment called “Module 6 Lab Activity” on the course Canvas page.